Al-Azhar International Medical Journal

Volume 4 | Issue 7 Article 19

2023
Section: Obstetrics and Gynecology

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How to Cite This Article

Ali, Samir Abdallah; Mustafa, Abdel Monsef Abdel Ghaffar; and Ali, Ali Mohammed (2023) "Study the correlation between placental thickness and fetal weight," *Al-Azhar International Medical Journal*: Vol. 4: Iss. 7, Article 19.
DOI: https://doi.org/10.58675/2682-339X.1909

ORIGINAL ARTICLE

Study the Correlation Between Placental Thickness and Fetal Weight

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Abstract

Background: **The placenta is around 3 cm thick at term when the cord is inserted in the third trimester. To measure placental thickness transabdominally, one must position an ultrasound transducer perpendicular to the placenta's plane.**

Aim and objectives: **The purpose of this study was to examine the relationship between placental thickness and foetal weight.**

Patients and methods: **300 pregnant women participated in this cross-sectional prospective study, which was carried out at the Al-Hussein University Hospital's outpatient gynaecology clinic.**

Results: **The mean Placental thickness (mm) was 31.89 ± 7.50, and the mean fetal weight (gms) was 2272.91 ± 1379.07. The APGAR was divided into three groups, the first group from 3 to 7, (9.0%), the second group was less than 3 (2.0%), and the third group was More than Seven, (89.0%), and there were also 13 newborns who needed Neonatal ICU.**

Conclusion: **The study's findings reveal a strong positive relationship between placental thickness and foetal weight, making the measurement of placental thickness at the site of umbilical cord insertion a reliable sonographic indication of foetal weight. The relationship between a low Apgar score, low birth weight, and more nursery admissions was discovered to exist.**

Keywords: Correlation, Fetal weight, Placental thickness

1. Introduction

The primary purpose of the human placenta throughout development is to supply the foetus with nutrition and oxygen.[1] It is obvious that a healthy foetus depends on the placenta's appropriate development during pregnancy. On the other hand, any disruption to its development may have a significant effect on the development of the foetus and the course of the pregnancy.[2]

Substrate exchange across the interface is physically constrained by the placenta's structure and is reliant on transport proteins, electrochemical gradients, and diffusion channels. Nutrients must travel a long way to get through the placenta and into the foetus's bloodstream. Substances, gases, and water from the mother's circulation must pass through two layers of placental villi in order to reach the foetus.[3]

Therefore, nutrients and solutes are transported throughout the syncytiotrophoblast using a variety of passive and active methods, such as flow-limited diffusion, transcellular diffusion, facilitated diffusion/protein-mediated transfer, and endocytosis/exocytosis. Through the foetus's basement membrane and micro villous plasma membrane (MVM), the majority of nutrients enter the bloodstream (BM). Others have conducted extensive study on a variety of transporter subtypes expressed in the placenta, localisation to the MVM and/or BM, and transporter types (such as facilitated, active, passive, uni- or bi-directional, etc.). At term, the placenta is 15−25 cm in diameter and 3 cm in thickness. Placental thickness, which may have a substantial impact on the perinatal outcome, is closely related

Accepted 2 January 2023.
Available online 30 November 2023

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https://doi.org/10.58675/2682-339X.1909

to the health of the developing foetus.[4] A straightforward method of determining foetal size is through sonographic measurements of several foetal body components. There are numerous methods available for calculating foetal weight based on the head (BPD, HC), abdominal (AC), and femur measures of the foetus (FL). Up to three body parts can be measured for weight prediction algorithms to become more accurate, with measurements of the head, abdomen, and femur yielding the maximum accuracy.[5] During pregnancy follow-up by ultrasound, placental thickness may be utilised as a potential indicator of expected foetal birth weight (EFBW) and other foetal characteristics.[6]

The purpose of this study was to examine the relationship between placental thickness and foetal weight.

2. Patients and methods

This cross-sectional prospective study, conducted at the outpatient gynaecology clinic of Al-Hussein University Hospital, included 300 pregnant women.

2.1. Inclusion criteria

Single pregnancy, gestational age from 32 to 40 weeks, accurate date, a history of regular menstruation and patient age from 30 to 35 years.

2.2. Exclusion criteria

Pregnancy-related conditions such as pregnancy-related hypertension, diabetes, hydrops fetalis, congenital defects, twins, polyhydramnios, and abnormal placenta.

2.3. Methods

2.3.1. History taking

Complete History taking (Personal, Menstrual, and Obstetrical, Contraceptive and Past history) from all consented patients and general and local examination have been done with investigation.

2.3.2. Examination

Vital data (heat rate, blood pressure, respiratory rate). Body weight: signs of anemia (pallor, angular stomatitis, koilonyechia), chest, cardiac and abdominal examination, examination to rule out any abnormal pregnancy signs.

2.3.3. Investigation

Sonographic measurement of placental thickness and routine investigations (CBC, serum glucose, renal function test). The three best measurements for each case were averaged to determine the placental thickness in millimetres. Consequently, third and fourth trimesters are the Using a Toshiba or Samsung colour Doppler scanner and a 3.5-MHz convex transducer held perpendicular to the placenta's plane, the placental thickness was assessed transabdominally (32–40 weeks). The placental thickness as measured by ultrasound will be used to estimate the foetus's birth weight, along with other foetal measurements including the femur length, biparietal diameter, head circumference, and belly circumference (AC). Examples of secondary outcome markers include birth weight, the Apgar Score, NICU hospitalisation, and newborn morbidity and mortality.

2.3.4. Analytical statistics

The statistical tool for social science, IBM SPSS version 20, was used to collect, analyse, code, and enter data. Quantitative data were displayed as means, and qualitative data were displayed as words and percentages, standard deviations, and ranges if it was determined that their distribution was parametric. A separate *t*-test was used to compare two independent groups with parametric distributions and numerical data.More than two independent groups were compared using the One Way ANOVA test, together with quantitative data and parametric distribution.

3. Results

Table 1.

There were 300 pregnant women in this study. The average BMI was 28.79 2.59, the average age was 32.64 1.72 years, the average height was 1.65 0.06 m, and the average weight was 78.80 8.16 kg (Table 2).

The mean Gestational age (weeks) was 35.77 ± 2.48, and the mean FL (mm) was 68.02 ± 5.19 (Table 3).

3.1. Primary outcome

The mean Placental thickness (mm) was 31.89 ± 7.50, and the mean fetal weight (gms) was 2272.91 ± 1379.07 (Table 4).

Table 1. Distribution of the studied cases according to age, height (m), Weight (kg) and BMI.

	Number = 300	
	Mean ± SD	Range
Age	32.64 ± 1.72	30–35
Height (m)	1.65 ± 0.06	1.55–1.75
Weight (kg)	78.80 ± 8.16	59–95
BMI	28.79 ± 2.59	22.04–35.65

Table 2. Distribution of the studied cases according to gestational age (weeks) and FL (mm).

	Mean ± SD	Range
Gestational age (weeks)	35.77 ± 2.48	32–40
FL (mm)	68.02 ± 5.19	58.34–78.66

Table 3. Distribution of the studied cases according to placental thickness (mm) and fetal weight (gms).

Primary outcome	Mean ± SD	Range
Placental thickness (mm)	31.89 ± 7.50	18–40
Fetal weight (gms)	2272.91 ± 1379.07	262–4630

3.2. Secondary outcome

The APGAR was divided into three groups, the first group from 3 to 7, (9.0%), the second group was less than 3 (2.0%), and the third group was More than Seven, (89.0%), and there were also 13 newborns who needed Neonatal ICU (Fig. 1 and Table 5).

The aforementioned table demonstrates that there was no statistically significant relationship between systolic and diastolic blood pressure, placental thickness, age, height, weight, or BMI (mm). heart rate, gestational age (weeks), and FL (mm), but that placental thickness (mm) and foetal weight had a statistically significant correlation (gms) (Fig. 2).

There was no statistically significant link between foetal weight and the variables in the previous table (gms), age, height (m), weight (kg), BMI, systolic blood pressure, diastolic blood pressure, heart rate, gestational age (weeks), and length of labour (mm), but there was a correlation between foetal weight (gms), placental thickness, and these variables. (mm) (Table 6).

The previous table demonstrates that there were highly statistically significant differences in placental thickness (mm) and foetal weight between the three groups (Fig. 3).

According to the previous data, there were highly statistically significant variations in placental thickness (mm) and foetal weight between the two groups (gms).

Table 4. Distribution of the studied cases according to APGAR and Neonatal ICU.

Secondary outcome	Number (%)
APGAR	
From 3 to 7	27 (9.0%)
Less than 3	6 (2.0%)
More than seven	267 (89.0%)
Neonatal ICU	
No	287 (95.7%)
Yes	13 (4.3%)

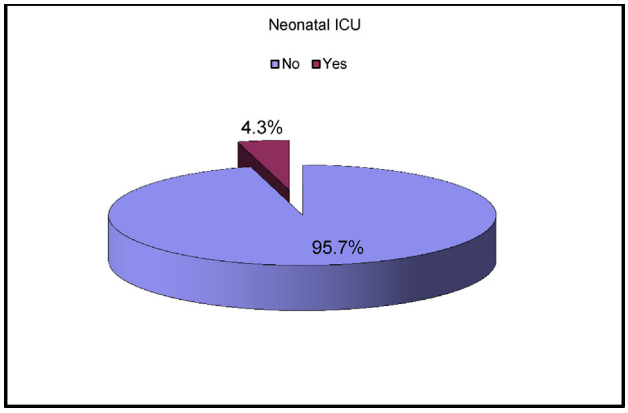

Fig. 1. Distribution of the studied cases according to Neonatal ICUs.

4. Discussion

Preeclampsia, chromosomal abnormalities, severe maternal diabetes mellitus, Small placentas are associated with intrauterine growth restriction, recurrent foetal infections, and both.[7]

The idea that reduced placental size precedes foetal growth limitation underlies this prediction of growth-restricted pregnancies. An essential component of obstetric therapy is estimating the weight of the foetus. This is done in a variety of ways, including tactile foetal size measurement, maternal self-estimation, birth weight prediction formulae, and algorithms developed from maternal and pregnancy-specific factors.[8]

By aligning the ultrasound transducer perpendicular to the placenta's plane in the third trimester's location of cord insertion—where the placenta is about 3 cm thick at term—it is possible to assess the placental thickness transabdominally.[9]

By using volumetric calculations and two-dimensional ultrasonography, placental weight can be precisely estimated. This method works well for routine prenatal care as well as high-risk scenarios with restricted foetal mobility and IUGR since it is

Table 5. Placental thickness (mm) and foetal weight (gms), age, height (m), weight (kg), BMI, systolic and diastolic blood pressures, heart rate, gestational age (weeks), and FL are correlated with each other (mm).

	Placental thickness (mm)	
	r	*P* value
Fetal weight (gms)	0.368**	0.000
Age	−0.098	0.089
Height (m)	0.057	0.324
Weight (kg)	0.036	0.532
BMI	0.017	0.774
Systolic Blood pr	−0.028	0.633
Diastolic blood pr	0.104	0.072
Heart rate	−0.004	0.946
Gestational age (weeks)	−0.090	0.118
FL (mm)	−0.030	0.605

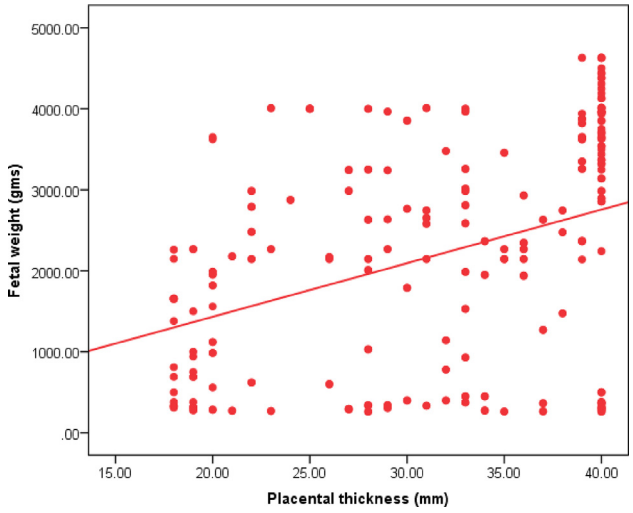

Fig. 2. Positive correlation between placental thickness and foetal weight (gms) (mm).

simple, rapid, and accurate. Continuous evaluation of the estimated placental volume (EPV) may help to lower the frequency of perinatal issues, such as unexpected IUFD.[10]

This study aimed to investigate the connection between placental thickness and foetal weight. The study had 300 pregnant participants. The average weight was 78.80 kg, the average height was 1.65 m, and the average age was 32.64 years. The average BMI was 28.79 kg.

While all the participated pregnant women were all non-smokers, of whom 22 women, 7.3%, suffer from Hypertension, as well as 17 women, 5.7% suffer from diabetes. The percentage of women who had only one parity was 14.0% of the total pregnant women and 30.7% had been pregnant twice and 30.3% had been pregnant three times and 17.3% had been pregnant Four and 7.7% had been pregnant Five times.

Placental thickness was measured using ultrasonography in the second and third trimesters, with changes between them measuring 21.68 4.52 and 14.67 5.67 mm, respectively. It connects to the foetus by an umbilical cord of appr ±6.46, approximately 55–60 cm (22–24 in.) in length at term with a diameter of 2.0–2.5 cm.[11]

Our results showed that the mean Placental thickness (mm) was 31.89 ± 7.50, and the mean fetal weight (Gms) was 2272.91 ± 1379.07, and that was our primry outcome. While the secondary outcome was that APGAR was divided into three groups, the first group from 3 to 7, (9.0%), the second group was less than 3 (2.0%), and the third group was more than seven, (89.0%), and there were also 13 newborns who needed Neonatal ICU.

Similar to this, a previous study by Mital et al.[12] had found that the mean placental thickness was slightly more than the gestational age up to 21 weeks (1–4 mm). Gestational age and placental thickness were found to be significantly positively correlated, according to Karthikeyan et al.[13] placental thickness (mm) measurements between 27 and 33 weeks of gestation almost exactly matched gestational age, according to Jain et al. (weeks). Similar to this, According to a recent study by Elchalal et al., gestational age and placental thickness, which increased linearly during pregnancy, are correlated. Placental thickness (mm) and foetal weight were statistically significantly different across the three groups, although there were no statistically significant associations between FL (mm), gestational age (weeks), systolic blood pressure, BMI, age, height, or weight (mm).A study by Nagpal et al.[14] that included data on the weights, lengths, and head circumferences of 4750 children born in Turkey validated our findings. This study used data from 11 different hospitals, however the sample size was tiny. At 28 weeks of pregnancy, data on birth weight began to be collected. Even though we only used data from the 28th week in Fig. 6 to compare our outcomes to those of Nagpal et al.,[14] we did collect birth weight data from the 24th week in our evaluation. We noticed an expanded commonness of neonatal bleakness in the Sadler et al.,[15] preliminary, as proven by low

Table 6. Comparison between APGAR from 3 to 7 (Number = 27), APGAR Less than 3 (Number = 6) and APGAR more than seven (Number = 267) regarding Placental thickness (mm) and Fetal weight (gms).

	APGAR			Test value	*P* value
	From 3 to 7 Number = 27	Less than 3 Number = 6	More than seven Number = 267		
Placental thickness (mm)					
Mean ± SD	36.89 ± 5.30	29.83 ± 8.75	31.43 ± 7.55	6.893[a]	0.001
Range	19–40	19–40	18–40		
Fetal weight (gms)					
Mean ± SD	3279.52 ± 1067.86	2314.50 ± 1288.06	2169.80 ± 1371.69	8.329[a]	0.000
Range	305–4130	306–4250	262–4630		

P value > 0.05: Non significant (NS); *P* value < 0.05: Significant (S); *P* value < 0.01: highly significant (HS).
[a] One Way ANOVA Test.

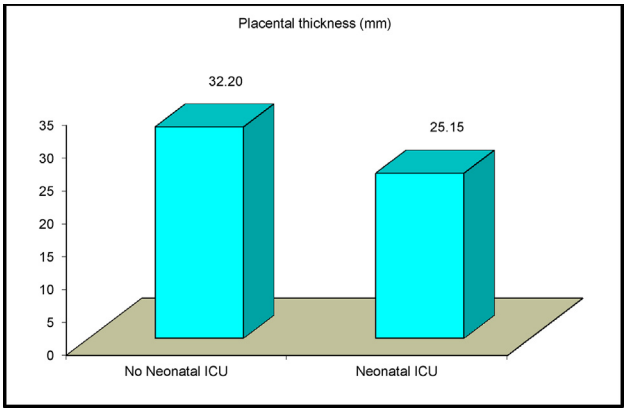

Fig. 3. Comparison between No Neonatal ICU (Number = 287), and Neonatal ICU (Number = 13) regarding Placental thickness (mm) and Fetal weight (gms).

Apgar scores and an expansion in NICU confirmations among ladies with placental thickness of 4.0 cm at 36 weeks. Furthermore, our exploration showed that mothers with thick placentas had a higher commonness of low-birth weight infants. In our review, it was also demonstrated that placental thickness and measured foetal weight have meaningfully favourable associations. The placental volume grew with gestational age, indicating a positive relationship, whereas in the hatchling with developmental restrictions, it dropped. Because it implies that aberrant placental thickness for gestational age may be the earliest sign of a foetal development barrier, this link between placental thickness and developmental milestones is significant. A substantial positive connection between placental thickness and ultrasonographic gestational age in days in the two groups is seen in the review by Mathai et al.[16] (*P*-worth of 0.01).

The difference in placental thickness (mm) and foetal weight between the three groups was highly significant, per the findings of the APGAR evaluation (Gms), there was a converse connection between placental thickness and fetal weight (Gms) (mm). The solid connections found in our concentrate between lower Apgar scores in the ordinary reach and pregnancy complexities, neonatal grimness, and the expanded gamble of cerebral paralysis, epilepsy, mental imbalance, These additional detrimental formative effects in kids with lower Apgar scores of 7, 8, and astonishingly, 9, as opposed to an Apgar score of 10, shed insight on earlier findings.[17]

4.1. Conclusion

The measurement of placental thickness at the location of umbilical cord insertion is a reliable sonographic indicator of foetal weight because the results of this study demonstrate a significant positive correlation between placental thickness and foetal weight. A poor Apgar score, low birth weight, and more nursery admissions were found to be related with placental thickness below the 10th percentile.

Authorship

All authors have a substantial contribution to the article.

Disclosure

The authors have no financial interest to declare in relation to the content of this article.

Sources of funding

This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

Conflicts of interest

The authors declared that there were NO conflicts of Interest.

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